GET STARTED

Architecting Your Multi-Cloud Environment

Build the right foundation to accelerate application modernization

vmware

Software is at the Heart of Digital Transformation

Across the globe, major forces are accelerating transformation in the enterprise. The need for business continuity amidst upheaval, the swift shift to remote work, and the ongoing quest to improve the customer experience are key drivers for change. And at the heart of this transformation is software.

More than ever, organizations are prioritizing the transformation of applications to meet the demands of today and tomorrow.

88%
of senior business and IT leaders feel that improving their application portfolio is the key to improving customer experience to drive revenue.[3]

New Software, New Opportunities

More software will be deployed in the next five years than has been built in the last 40 years.[1] Organizations are realizing the value of building new applications that take advantage of cloud innovations like mobility and artificial intelligence. And they are leveraging modern software development constructs like the twelve factors, micro-services, containers and Kubernetes to build new apps that run in the cloud.

Existing software applications on the radar, too

Digital transformation isn't just about new software applications. Nearly three quarters (72%) of organizations are also looking to modernize their existing application portfolios.[2] They are doing so in two ways. First, they are refactoring applications to conform with modern software standards, so that the rebuilt application can can be optimized to run in a cloud environment. Second, they are extending the functionality of existing applications by tapping into unique cloud services offered by the hyper-scaler public clouds.

What does all this mean for architects?

Whether refactoring existing applications or building net new ones, the pressure is on architects to ensure that application environments are up to the task. This eBook examines the obstacles that organizations face as app modernization gains pace and demonstrates how architects can address these challenges.

1. CNBC. "Next frontier in Microsoft, Google, Amazon cloud battle is over a world without code." Eric Rosenbaum, April 1, 2020.
2. VMware Market Insights, "App Modernization in a Multi-Cloud World." 2020.
3. Forrester Consulting. "Improving Customer Experience and Revenue Starts with the App Portfolio." 2020.

The Need for Multiple Clouds

As organizations transform their application stacks by building new software or modernizing existing applications, it becomes evident that a single cloud cannot meet all of the needs of all of the apps in an organization's portfolio.

Each cloud provider offers unique services and advantages, with nuances in their innovation capabilities. Indeed, no two public cloud providers are the same when it comes to their:

- Portfolios of cloud services
- Suite of tools to support DevOps
- Pricing models
- Geographic locations and availability zones

And no two applications are the same, either. Organizations rightly want to match the requirements of each individual application to the cloud environment that can best meet those needs.

The need to match each application to the cloud that best meets its requirements leads naturally to the use of multiple clouds. The extent of multi-cloud use is evident in many studies from multiple analysts. These show a majority of organizations are using at least two public clouds while continuing to operate an on-premises environment as well.

A Major Obstacle? The Lack of Developer and Operator Skills

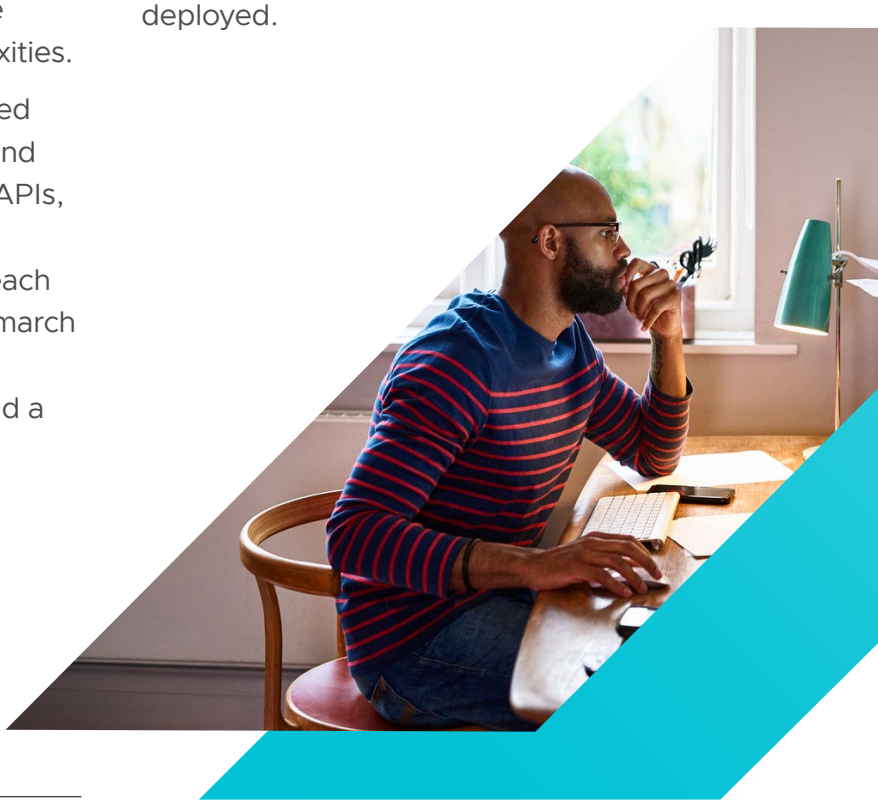
Most organizations are in the early phases of their app modernization journeys. More than fifty percent of organizations have containerized less than a quarter of their application portfolios. And while Kubernetes has become the defacto infrastructure for running modern apps, 80% of organizations are still in a phase that can best be characterized as experimental.[4]

One of the biggest obstacle cited to the broad use and adoption of these new technologies is a lack of developer and operator skills.[5] The addition of multiple clouds creates new operational complexities.

If each cloud is run as a separate, isolated silo, with its own unique development and operating model, taxonomy and set of APIs, there are new skills to learn in order to leverage the innovation capabilities of each cloud environment. As a result, on the march to multi-cloud, many organizations experience an uptick in people costs and a downturn in organizational efficiency.

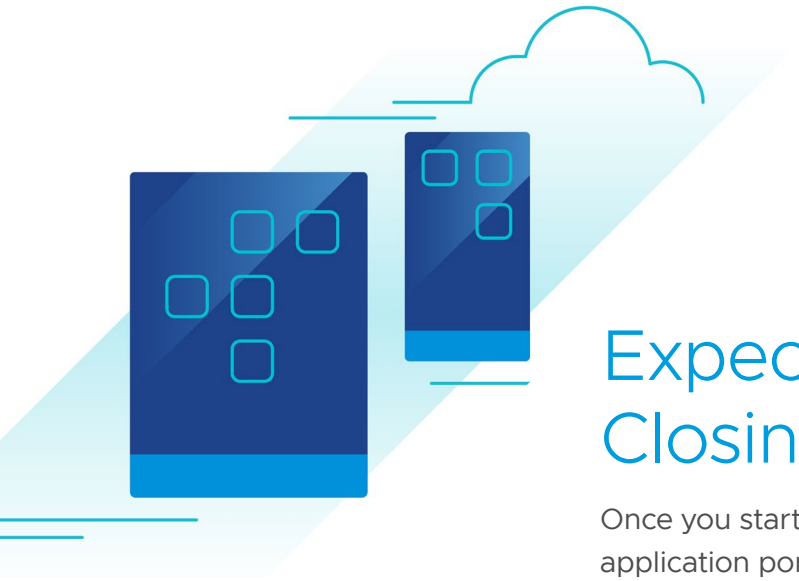
80%
of senior business and IT leaders feel that matching the best platform to each app is extremely challenging.[6]

At the same time, operational risk increases. Differences between cloud environments make it harder for app dev teams to quickly troubleshoot application performance issues when they arise. And the differences make it hard to consistently apply policies carefully designed to make sure apps are always secure and compliant wherever they are deployed.



4/5. VMware Market Insights. "App Modernization in a Multi-Cloud World." 2020.

6. Forrester Consulting. "Improving Customer Experience and Revenue Starts with the App Portfolio." 2020.



Expectations vs Reality: Closing the Gap

Once you start to experience the challenges of modernizing your application portfolio, it becomes easier to articulate what you would like to see in an ideal cloud environment. Below are what 1,200 App Dev and IT operations professionals told VMware that they would like to see.[7]

Responding to this study, organizations used the following phrases to describe their ideal cloud environment:

- Manage consistently, everywhere: All applications are managed consistently regardless of where they are deployed.
- Build, move and run anywhere: Seamless portability that delivers the freedom to move applications from public cloud to public cloud without rewriting and to build on their cloud of choice.
- Secure and protect every app: No matter where an application is run, it is secure and protected.
- Dev/IT collaboration support: Developers and operations teams can collaborate easily.
- Change and adapt, without penalty: Migrate to a new cloud seamlessly and change environments without rewriting or refactoring.

7. VMware Market Insights. "App Modernization in a Multi-Cloud World." 2020.

Expectations vs Reality: Closing the Gap

The current reality is more complex

Most organizations are nowhere near this ideal state. Developers use a different toolset for each cloud they build modern apps on, and each toolset has its own learning curve. With app dev and operational resources already stretched, cloud differences just drive more work and more inefficiencies into the organization.

Likewise, when it comes to the migration of traditional applications, there is no easy route. Traditional applications have inflexible dependencies on infrastructure—in preparing to move an application to a cloud environment, it's almost inevitable that coding changes will be required.

The differences between clouds raise challenges around security and compliance, too. Instead of simply addressing security and compliance for a single operating environment, you are faced with having to deal with unique cloud environments, each with their own rules and requirements.

Five Key Principles to Guide Your Multi-Cloud Environment

To get the most out of your application portfolio and to leverage the innovation that will drive your business forward, you know you have to be on multiple clouds. Yet with every new cloud that you add to the mix, the operating model becomes more complex, driving higher operating costs, increased operational and reputational risk, and poor leverage of scarce resources.

As an architect, whether your title starts with 'cloud', 'application', 'enterprise', 'platform' or something similar, you play a key role in helping your organization reach the ideal state for application modernization across multi-cloud environments.

Across any combination of clouds, architects should focus on five overarching principles:

1. Build In flexibility: Architect an environment that increases business agility by allowing each application to be deployed to the cloud that best meets its requirements.
2. Evolve without penalty: Architect an environment that lowers costs by supporting the ability to move applications between environments without refactoring.
3. Seek operational simplicity: Architect an environment that reduces complexity and improves security through the use of a unified operating model.
4. Fully optimize resources: Architect an environment that minimizes learning curves by providing high levels of skill leverage for both developers and IT operators.
5. Maximize automation investments: Architect an environment that supports the ability to scale up automation across the full scope of operations.

Lowering Barriers to Effective Multi-Cloud Use

Getting to the ideal state —with consistent management and operations across any cloud—requires a rethink of how platforms are architected. Today public clouds exists as vertically integrated silos with little support for interoperability between different cloud environments.

What is needed is an approach that abstracts the differences between clouds by providing a set of horizontal capabilities that help unify cross cloud operations while at the same time providing access to the unique and innovative portfolio of cloud services delivered by each cloud provider.

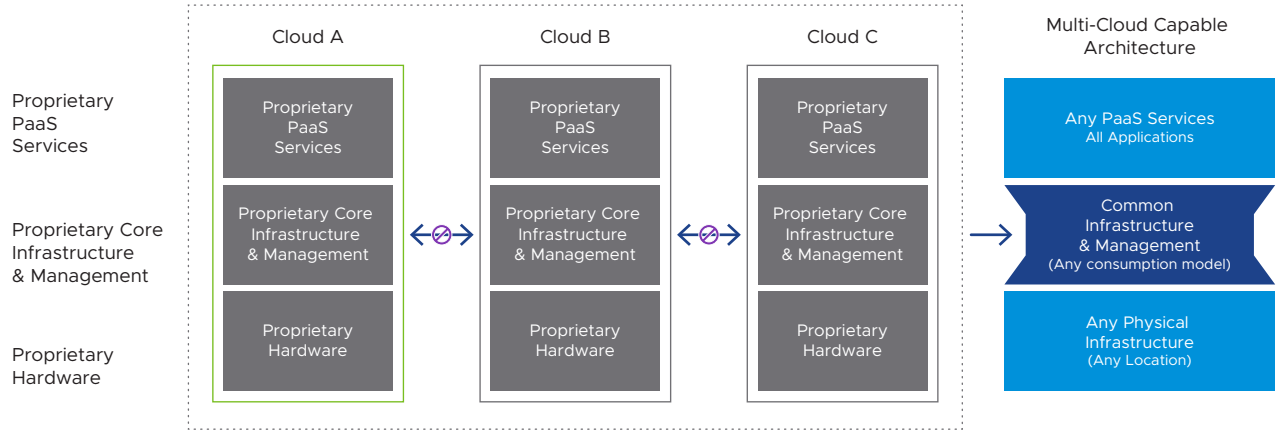


FIGURE 1. The challenge of siloed public clouds

VMware Cloud: Application Modernization Across Any Cloud

VMware delivers a software defined infrastructure, Platform-as-a-Service (PaaS) and management stack that can be layered on top of any physical hardware layer on any cloud or data center.

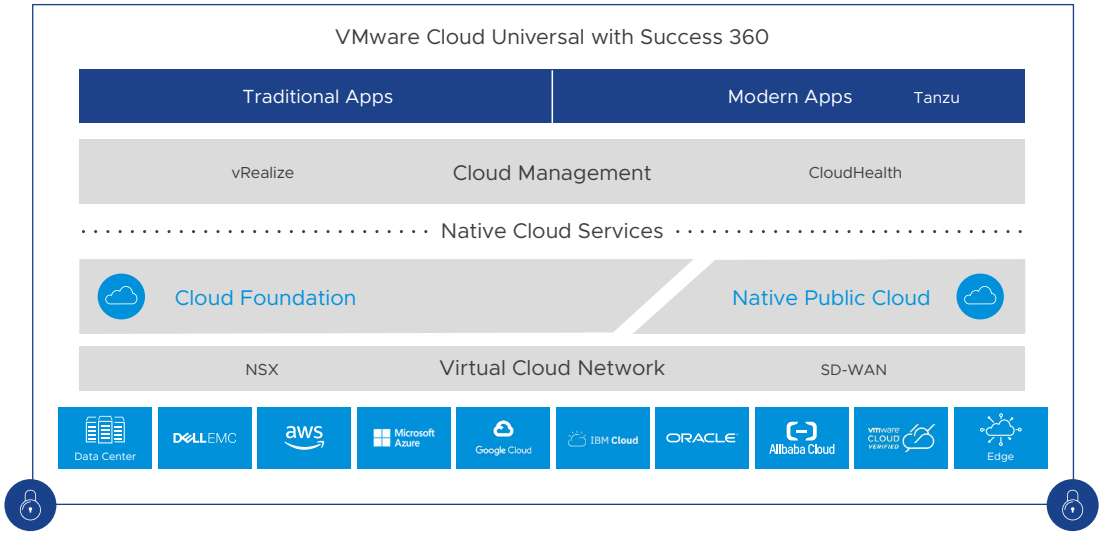


FIGURE 2. VMware Cloud

The stack provides a unified approach to building, running and managing traditional and modern apps on any cloud. This unique architectural approach provides a single platform that can function across all application types and multiple cloud environments.

A Cloud Architecture Aligned to Your Objectives

Here is a quick summary of how VMware's approach supports key areas that are critical to the execution of application modernization strategies:

Building new applications

VMware Tanzu™ products and services deliver a broad set of capabilities that help organizations build, run and manage modern apps on any cloud. Multi-cloud capabilities include a Kubernetes runtime and multi-cloud control plane. In addition, VMware has integrated Kubernetes directly into VMware Cloud. This approach allows organizations to run and manage all their applications, both traditional and modern, using Kubernetes.

Achieving multi-cloud mobility

VMware is the only vendor that gives organizations the option of running a common software cloud stack in the data center, across thousands of managed service provider partners, and across all major hyper-scaler clouds. Previously known as the Software Defined Data Center and now as VMware Cloud Foundation™, the VMware cloud stack includes virtualized compute, storage, networking and management. Leveraging VMware Cloud Foundation across multi-cloud environments, organizations can easily migrate a traditional application running in the data center to any public cloud and then modernize it or continue to run it "as is" depending on business requirements.

A Cloud Architecture Aligned to Your Objectives

Leveraging scarce skills

VMware solutions support consistent management and operations in multiple ways. For example, CloudHealth® by VMware provides cloud financial management consistency across major hyper-scaler clouds and any clouds based on VMware technologies. VMware Tanzu provides a consistent approach for running and managing Kubernetes. It also provides a consistent approach to PaaS across any cloud. VMware vRealize®, which is part of VMware Cloud Foundation, supports a consistent approach to operations management that helps to optimize and automate resources across the data center, across thousands of managed service providers, and across all major hyper-scaler clouds.

A Closer Look at VMware's Approach

Scenario one: Replatform existing apps to Kubernetes

Replatforming is often considered in the context of moving a traditional app from the data center to a public cloud. Yet it can also involve taking a traditional, VM-based application and containerizing it to make it simpler to manage. VMware delivers a simple and quick way to embrace Kubernetes.

VMware Tanzu capabilities are packaged into three editions, each matched to a common customer challenge. Tanzu Basic edition makes Kubernetes a feature of vSphere, so your current team can provision Kubernetes clusters just as they do virtual machines. vSphere with Tanzu leverages and extends the Kubernetes API to support all application types (including VMs). This means all existing VM-based applications can be managed with Kubernetes with only minimal changes.

A Closer Look at VMware's Approach

Tapping into the rich innovations of Kubernetes

The most powerful aspect of this is that developers and DevOps teams have a direct Kubernetes interface into the infrastructure. The self-service capability allows users to easily provision and manage applications while taking advantage of the rich innovation happening on Kubernetes.

Yet, under the hood, it's still the familiar VMware vSphere platform. All the tooling, training and skill sets that you have invested in will continue to apply—even to new containerized applications. Developers get all the benefits of the new platform, while the operations teams can leverage existing skills around managing VMware technologies.

Managing Kubernetes across multiple clouds

While vSphere with Tanzu is the fastest path to Kubernetes on-premises, many enterprises will want to deploy and operate Kubernetes across multiple clouds, including public clouds and edge environments.

Tanzu Standard edition enables you to run the same Kubernetes distribution across multiple clouds for consistency. It includes a centralized control plane from which operators can manage policy and security for all Kubernetes clusters. And it provides platform monitoring dashboards out of the box. In summary, managing multiple clusters across multiple to meet the needs of multiple development teams gets complicated, quickly. Tanzu Standard is designed to keep multicloud Kubernetes simple, so you can operate with efficiency and confidence.

There are approximately
70 million
applications running on
VMware vSphere today.

A Closer Look at VMware's Approach

Scenario two: Developing new apps and refactoring existing apps

Creating new apps and refactoring existing apps is fundamental to driving new revenue and competitive differentiation. VMware is behind the technologies that your developers use today to build apps as microservices.

Build modern apps

More than three million developers choose Spring to build Java-based applications. Those developers start two new applications every second with Spring Initializr. Millions more tap into the Bitnami catalog of container images to work with building blocks that accelerate development cycles. We've harnessed those technologies in the Tanzu portfolio.

Tanzu Advanced edition encompasses the full capabilities of the portfolio—it simplifies and secures the entire container lifecycle. Developers can build new applications with Spring—fully supported by VMware. Their code is automatically packaged into containers that are compliant and consistent with IT requirements. Those containers can include golden images, pulled from a curated catalog and always updated. And integration of your CICD pipeline ensures those containers are delivered to your private registry.

A Closer Look at VMware's Approach

Tanzu Advanced ensures those containers are orchestrated by Kubernetes, and managed by your operations team from a centralized control plane. Operators apply policies for access, data protection, security and more to individual clusters or groups of clusters. And this entire container lifecycle is both connected via service mesh and observable, from infrastructure health down to individual application performance.

Finally, when enterprises need help constructing these components into a cloud native application development platform, the Tanzu Labs team is ready. Tanzu Labs work in paired teams with application developers to build critical, new apps, and they work with operators to architect, deploy and integrate the underlying platform. The team has completed more than 2,000 such projects for leaders across industries.

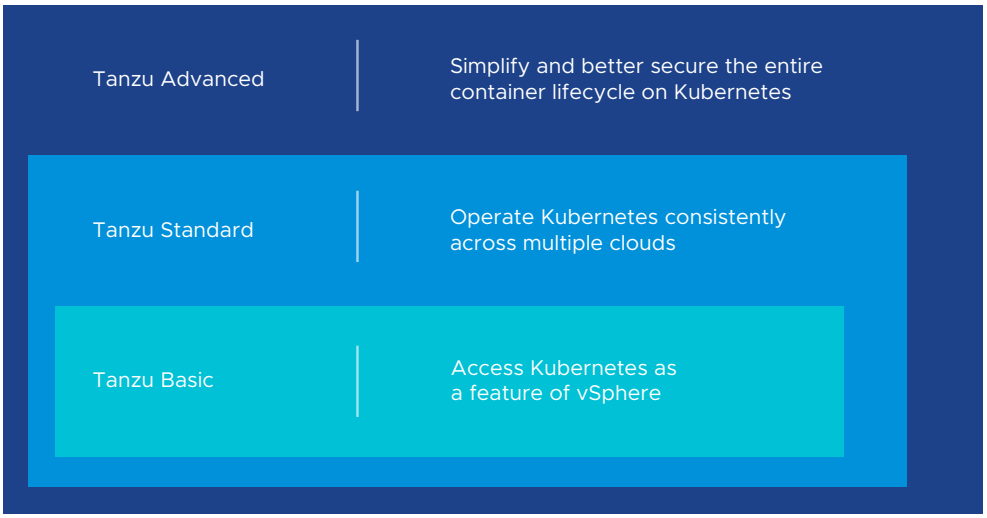


FIGURE 3. VMware Tanzu editions summary

A Closer Look at VMware's Approach

Scenario three: Migrate existing apps to a preferred cloud

Many organizations are looking to migrate traditional applications to the cloud and then to modernize them. Unfortunately, app to infrastructure dependencies with traditional applications often mean that significant, non-value add code changes must be executed just to get the application to run in the new environment.

To simplify cloud migration, VMware Cloud Foundation delivers consistent infrastructure across multiple cloud environments. With VMware Cloud Foundation deployed across all of the environments you use, you can easily migrate applications without code changes and then modernize those applications on a schedule that meets business priority needs and makes the best use of scarce app dev resources.

More choice in how you consume cloud infrastructure

VMware Cloud Foundation delivers unprecedented choice in how organizations consume cloud infrastructure along two dimensions: cloud environment and consumption model.

With the consumption model, organizations can choose to operate the VMware cloud stack themselves or consume it as-a-service, delivered by VMware or one of VMware's many partners.

When it comes to the cloud environment, or location, the VMware cloud stack can be deployed in an on-premises data center, at a service provider's data center, on a hyper-scaler cloud, or at edge locations (retail stores, factories, etc).

A Closer Look at VMware's Approach

More freedom to execute data center strategies

Even if no changes are made to the application, you can derive value by simply changing the cloud environment and/or the consumption model. For example:

- Reducing the data center footprint
- Supporting cloud DR scenarios without app modification
- Bursting capacity to support temporary or seasonal needs
- Bringing the application—or one of its components—closer to higher-level cloud services to take advantage of the cloud provider's low-latency, high-bandwidth, no-egress-charge access

If your goal is to eventually retire or to replace an application, that same common infrastructure gives you more freedom around how you execute your data center strategy. By moving the application to a public cloud before decommissioning it, you can proceed to reduce or eliminate your data center footprint, reducing the cost and complexity of your data center environment.

Step By Step: Evolve Your Cloud Architecture

Architecting your application modernization and multi-cloud strategy starts with an assessment of the needs of your application portfolio. As well as evaluating what you have now, think about the applications you expect to build in the future.

For the applications you expect to build net new, what tools will provide you the most leverage across the clouds you plan to build, run and manage your applications on?

And what's the roadmap for your existing applications? Do you plan to modernize them, either by refactoring or extending functionality using cloud services? Do you plan to keep them "as is" but replatform them to Kubernetes, leveraging a modern approach to lifecycle management for the application? Do you want to keep them "as is" but run them in a public cloud? Or is it time for retirement? Naturally, the answer will differ for each application.

Closing the capabilities gap

After you have taken stock of the tools and environments you need to support your application portfolio, the next step is to assess the gap between what you need and where you are now, using the architectural principles discussed on page nine as your guide.

As well as considering your technology needs, consider the dimensions of people and process, too. Rarely does technology alone solve any real-world problems.

Once you understand your current state, future goal, and the gap between these, you can build a plan. Break down your big-picture vision into prioritized, manageable chunks, remembering that one-size-fits-all approaches do not work. Every organization will follow a unique path, taking into account the unique gap you need to close, while bearing in mind your most pressing concerns and biggest opportunities.

VMware Can Help You Architect a Successful Strategy

For help architecting a future state that accelerates your application modernization efforts, engage your local VMware team or one of the many thousands of partners that support VMware technologies. Working side by side with you, we can help architect an approach to application modernization that provides your organization with the best combination of choice, flexibility and operational simplicity.

Join us online:

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